



Forest Stand Improvement with Crop Tree Management

What is Crop Tree Management?

Crop Tree Management (CTM) is a forest stand improvement practice based on a “crown-touching” release technique. This technique focuses on releasing individual trees that have been pre-selected to produce benefits consistent with landowner goals and site objectives. Crop Tree Management involves careful identification of landowner goals, establishment of stand-specific objectives, and development of crop tree selection criteria. This means the entire perimeter of each crop tree’s crown is “released” from competing tree crowns, (Figure 1) thereby redistributing the growth potential of the site to the best trees so that they get bigger, grow faster and move into larger diameter forest products sooner. Neighboring trees are cut if their crowns touch or extend over the crown of the crop tree. Crop trees are typically high value timber species or high value mast producing wildlife species. CTM typically follows a 6 step process.



Figure 1. Ground view looking skyward of a crop tree after release.

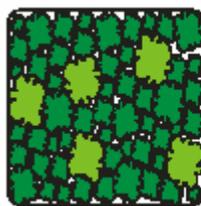
STEP 1: Identify landowner’s goals and objectives

Common landowner goals and objectives include improving the woodland for wildlife habitat and managing the stand for timber production – firewood, saw logs, and veneer, etc. Fortunately, both of these goals are compatible with one another. Selecting high value timber species for release not only stimulates the growth rate of the crop tree thereby allowing the selected crop trees to reach economic maturity sooner, but released trees will expand their crowns thus enabling them to produce more mast, (e.g., acorns, nuts, walnuts, berries, etc.) for wildlife consumption and for future regeneration of desirable tree species.

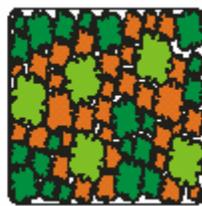
STEP 2: Select suitable species.

Most Missouri forests could benefit from CTR, but the greatest benefit will be realized on the more productive sites. These are the sites where measurable growth will occur the quickest and where returns on an investment will be realized soonest. Sites with deep, fertile and moist soils, sites with north and east slope aspects, and sites that are lower on the slope are the best choices.

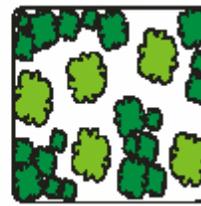
If timber production and/or improved wildlife habitat are goals for the landowner, then certain trees



Select Crop Trees



Mark Competing trees



Remove Competing Trees



Crop Tree Management

Conservation Practice Information Sheet (IS-MO666ctm)



should be favored to meet these goals. Desirable oak species such as white oak, bur oak, swamp white oak, northern red oak, scarlet oak, Shumard oak, black oak, and cherrybark oak are valuable timber species as well as important mast producing species capable of sustaining diverse wildlife populations. Hickory species are generally considered a marginal economic timber species but a valuable mast producing species. Hickory species that are typically found in Missouri include shellbark hickory, bitternut hickory, mockernut hickory, pignut hickory, pecan, and shagbark hickory. Black walnut is also a premier timber tree as well as an excellent fall and winter source of food for wildlife. Hackberry, basswood, silver maple, cottonwood, sycamore, Kentucky coffeetree, Ohio buckeye, sassafras, while not valuable timber or hard mast species, are none-the-less necessary associates of a healthy and diverse forest ecosystem and should be maintained, if possible, in the stand.

STEP 3: Determine crop trees.

Once specific goals and objectives have been established, criteria can be developed for selecting crop trees. These criteria are characteristics looked for when selecting crop trees. The following lists illustrate selection criteria for stands where wildlife, timber, or aesthetics (Figure 2) are the primary objective. Remember, these are only suggestions. Land users can—and should—develop criteria to suit specific goals. It is interesting to note that many high value timber crop trees are also premier mast producing species. For all tree species, crop trees should generally meet the following selection criteria:

Wildlife or General

- Large, healthy crowns in or above the main canopy.
- Mast-producing species (preferably hard mast).
- Trees with some dead branches and open cavities.
- Species variety.
- Longevity of 20 or more years.

Timber

- Large, healthy crown in or above the main canopy.
- High-value commercial species.
- High-quality tree with:
 - Base log with high-grade potential.
 - No branches on base log.
 - No lean, low forks, etc.
 - No insect or disease damage
- Species well adapted to the site.
- Expected longevity of 20 or more years.

Aesthetics

- Trees and species that are unique in appearance or character, produce attractive flowers and colorful foliage, or have attractive or unique bark.
- Visible from travel lanes, vantage points, etc.
- Expected longevity of 20 or more years.



Figure 2. These sugar maple trees qualify as both timber and aesthetic crop trees. Their brilliant fall foliage contrasts with the clear blue autumn sky.



Crop Tree Management

Conservation Practice Information Sheet (IS-MO666ctm)

STEP 4: Decide how many crop trees to release.

The intensity of the crop tree management operation will determine the appropriate number of trees to be released. For example, if the landowner decides that every crop tree should be released in a particular stand – this may result in a heavier cut. Other alternatives might concentrate on selecting the best 20 trees per acre – resulting in a lighter cut. Generally a maximum of 30-50 crop trees per acre are identified. Keep in mind that only the trees in direct competition with the crop tree should get cut; all non-competing trees should remain in the stand. In addition, if the residual midstory trees are removed to create a more open understory this may positively affect the regeneration of those desirable tree species requiring more sunlight for germination and growth. Canopy openings increase the amount of sunlight reaching the forest floor, thereby stimulating the growth of a variety of forbs, herbs, legumes, and other herbaceous plants utilized by wildlife. On the other hand, leaving midstory trees standing will reduce the open appearance of the stand and retain valuable wildlife benefits.

STEP 5: Choose which trees will be cut.

The crop tree management process requires determining which trees need to be removed in order to fully release the crop trees chosen. This is accomplished by observing each crop tree's crown and envisioning it divided into four separate quadrants or sides (Figure 3).

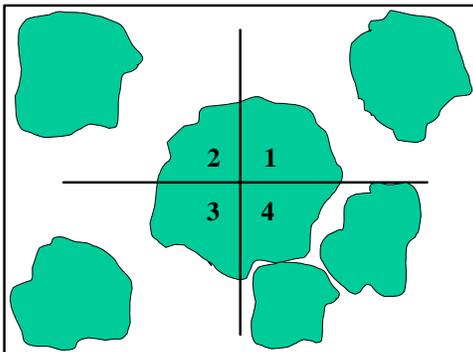


Figure 3. Crop tree broken into 4 quadrants.

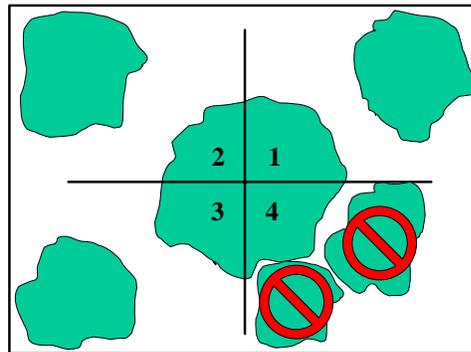


Figure 4. Quadrant "4" needs to be released.

A determination is then made to see how many of the four sides are free from competition by neighboring crowns. Each crop tree is classified from 0 to 4. A "0" classification means the crop tree crown has no room to grow. In contrast, a rating of "4" means there is no crown competition and the crop tree is free to grow on all of its four sides. A classification determination of "3" is shown in Figure 4. A crop tree that has only one or two feet between its crown and a neighboring crown is not free to grow in that quadrant. If there is doubt about whether an adjacent tree is touching and competing – eliminate it.

Healthy crowns of immature hardwood trees generally expand at the rate of one foot per year. Therefore, the growing space between adjoining crowns decreases by about two feet annually. Consequently, 15 feet of space between crowns provides adequate release for about seven or eight years for larger trees. A minimum of 3 to 5 feet of crown growing space should be followed for all crop tree releases. A CMT release essentially involves the removal of all trees with crowns that interfere with, or touch, the crop tree (Figures 5 & 6).



Crop Tree Management

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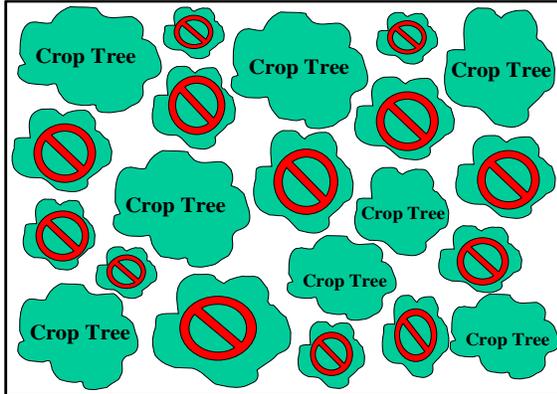


Figure 5. Crop trees identified for release.

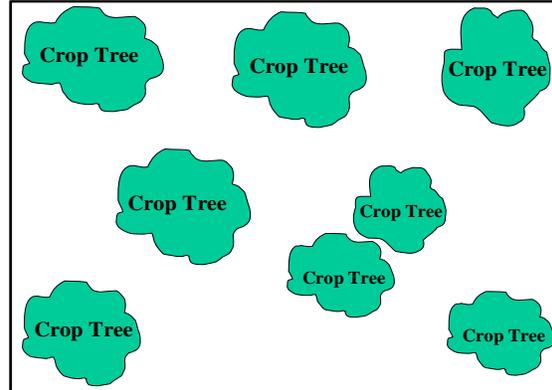


Figure 6. Competing trees removed.

In the event that two crop trees occur close together with adjoining crowns, it is acceptable to consider the two as one crown, and then release fully around the dual crown. Choose crop trees about 25 feet apart and avoid selecting V-connected trees.

STEP 6: Eliminate trees for crop tree release.

After all the trees have been selected and marked for removal, the next step is to eliminate the competing trees. Competing trees are eliminated by cutting, chemical treatment and/or girdling. Girdling (with or without chemical treatment) a tree in place results in a standing, dead snag, valuable for wildlife that no longer interferes with the growth of the crop trees. Properly girdled trees will die standing and will slowly decay. This provides cavities for wildlife and decay material for insects in the process.

References:

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Bardon, Robert E. and William E. Gardner. 2001. *Crop Tree Management in North Carolina*. North Carolina Cooperative Extension Service. Woodland Owner Notes. E01-3892B. 1/01-2.5M-JMG-310031. 10pp.

For additional information on Forest Stand Improvement, contact your local USDA Service Center or Missouri Department of Conservation office.

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